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IOWA AGRICULTURAL EXPERIMENT STATION
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Plant Pathology

CABBAGE DISEASES

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Cabbage diseases are the chief limiting factor in profitable commercial cabbage growing in Iowa. The most destructive of these are black-leg, black-rot, and cabbage yellows. Any one may destroy the greater portion of a crop. The first two are known to be distributed with the seed and cause infection of the young plants in the seed bed. Some of these naturally find their way into the field and under favorable conditions become destructive. Cabbage yellows may also be distributed with the seed but is probably more commonly spread with the plants by the soil adhering to the roots.

Fig. 1. Cabbage plant infected with black-leg; the disease has girdled the stem.

These diseases may remain alive in the soil for from two to twelve years. The first step in successful cabbage growing, therefore, is to prevent the development of these diseases. In order to do this the seed should be treated and the plants grown in soil free from disease.

BLACK-LEG

Black-leg is caused by a fungous organism whose presence is indicated by sunken spots with a purplish border on the stem just above the surface of the soil. The spots increase in size and depth until the stem is girdled as shown in fig. 1. This may occur either on the seedling or the nearly mature plant. When the infested tissues die, small black dots, known as pycnidia, are formed on the sunken spots.

The spores are borne in the pycnidia, which

enables the disease to live over from one year to the next. These may either remain attached to the old cabbage stumps in the fields or be set free in the soil. The spores may also adhere to the seeds. It is plain, therefore, that infection may come about either thru the infested refuse in the soil or the seedlings propagated from infected seed.

Control. Land that has grown an infested crop should not be planted to cauliflower or cabbage for a period of three or four years. It is well to practice a three or four year rotation and burn all infested cabbage stumps and other refuse. The seed should be treated before it is planted and the seed bed should be on land that has not grown cabbage for many years. If such soil is not readily available sterilize it as described later.

BLACK-ROT

Black-rot attacks cabbage plants in all stages of their development, either in the seed bed or in the field. It is caused by a bacterial organism which gains entrance to the plant thru the water pores at the margins of the leaves. As the disease spreads from the point of infection toward the mid-rib the leaf becomes yellow and the veins black. Infection may also occur from injuries made on the foliage by insects. When a plant is badly diseased the veins in the stem become black. A badly diseased plant under favorable conditions wilts and dies within a few days. Black-rot flourishes when the weather is hot and damp.

Control. Exercise the same precautions as given for black-leg.

CLUB-ROOT

Club-root is not generally distributed in Iowa but has been found in a severe form in one locality. This emphasizes clearly the necessity of guarding against this disease in any given locality. In many places in the east club-root is a serious menace to cabbage.

Club-root attacks only the roots of plants. It is caused by a slime mold that lives in the soil. If plants are attacked when young they die within a short time, while in older plants the leaves turn yellow and wilt. Outgrowths or galls are found on the roots as shown in fig. 2, thus the common name, club-root.

Fig. 2. Root system of cabbage plant almost totally destroyed by club root.

Control. There is a great deal of difference in the susceptibility of the various varieties of cabbage to this disease. The Hollander, Large Late Flat Dutch and Henderson's Early Summer are quite resistant but no variety escapes entirely. When land is infested with club-root it may be controlled by applying 150 bushels of air-slaked lime per acre. This should be worked in the soil to the depth of 6 to 9 inches six months previous to the setting of the cabbage.

CABBAGE YELLOWS

Cabbage yellows is one of the most destructive cabbage diseases found in Iowa and occurs quite commonly thruout the state. Often this disease destroys 95 per cent of a crop. Cabbage yellows is caused by a fungus parasite that can live in the soil for many years once it becomes badly infested. The threads of the parasite gain entrance into the plant thru the roots and finally make their way into the stem and leaves. The parasite interferes with taking up of water by the plant which causes the leaves to turn yellow and fall away as shown in fig. 3. This may take place with the young or nearly mature plants. This disease is most active when the weather is hot, as in July.

Control. A field that has grown an infected crop should not be used for cabbage again for many years. It has been shown that yellows will remain alive in the soil for 12 years. On new land it is advisable to practice a five-year rotation and under no circumstances should two crops of cabbage be grown on the same land in succession. Cabbage plants grown in soil that has been used for growing cabbage several years should be avoided as they are liable to carry yellows. It is also wise for each grower to propagate his own plants so as to run no chance of introducing this disease. Recently the Wisconsin Experiment station has developed a resistant strain of late cabbage known as the Hollander.

Fig. 3. Dropping of lower leaves caused by infection with cabbage yellows when plant was about half mature.

GENERAL CONTROL MEASURES

Seed. In purchasing seed buy the best quality. It should be of uniform size, hard and plump. Cheap seed is often a mixture of early and late varieties. This is often unfortunate for the man who is growing cabbage for the early market. In addition to being of good quality and purity as to variety, the seed should be free from diseases.

Seed treatment. Such diseases as black-rot and black-leg are carried on the seed. The first step, therefore, in successful cabbage growing is to exercise seed treatment. This is very easily done with corrosive sublimate, sold by druggists as bichloride tablets with directions for their use. Less than five cents worth of this poison will suffice to treat a pound of seed, which will grow enough plants for five acres of cabbage. The formula is as follows:

Corrosive sublimate (bichloride tablets) 1 part or 1 gram.
Water, 1000 parts or 1 quart.
Soak seed in this solution 20 minutes.

This solution should be made up in a stone jar or a wooden pail because

it corrodes metals. Immediately after the seed has been treated spread it on a clean cloth in a warm room to dry quickly. When thoroly dry return the seed to a clean sack, not the same sack from which it was taken before it was treated which may contain spores that will again contaminate the seed.

Seed bed soil. An infested seed bed is often responsible for a crop failure. After the seed has been disinfected it must be planted in clean soil in order to produce healthy plants. It is well to change the seed bed every year; but if this is not possible, as is often the case where the beds are large and of a permanent construction, the soil should be sterilized. For this purpose one may use either steam of formaldehyde.

STERILIZATION OF SOIL BY STEAM

The soil may be steam sterilized by either the inverted pan or the drain tile method with very satisfactory results.

Inverted pan method. This method consists of forcing steam under a large pan laid over the soil. The pan is made of no. 18 sheet iron 10 ft. long, 6 ft. wide, and 6 in. deep. The top 6 to 8 inches of the soil should be loosened up with a spade so that the steam can enter readily. When the soil is in condition and the pan is in place steam should be forced into the pan for one hour at 75 pounds pressure. A potato buried 6 in. deep in the soil under the pan may be used as an indicator. When this potato is cooked the soil has been sterilized long enough. The source of the steam may be either a greenhouse boiler, a threshing machine engine or any other type of steam generating machine carrying a pressure of 75 to 100 pounds.

Drain tile method. This method consists of laying lines of four inch tile in ditches ten inches deep and two feet apart and ridging up over them the soil to be sterilized. The entire surface of the ridge should be covered with canvas or building paper to confine the steam. Steam at high pressure should be allowed to flow into these lines for about four hours, or until a potato buried in the surface soil of the ridge is cooked.

STERILIZATION OF SOIL BY FORMALDEHYDE

This method is very simple and does not require a great deal of equipment. It is recommended that a solution consisting of one quart of commercial formalin to twelve and one-half gallons of water be sprinkled on the seed bed with a sprinkling can at the rate of one-half gallon per square foot of soil. Cover the soil with a canvas or heavy paper for twenty-four hours. At the end of this time it should be uncovered and allowed to dry rapidly. It is not advisable to plant cabbage seed in this soil until it has dried out which usually requires a week to ten days in the open. If the seed beds are to be used early in the spring it is desirable to treat the soil in the fall and avoid delay incident to the drying of the soil.